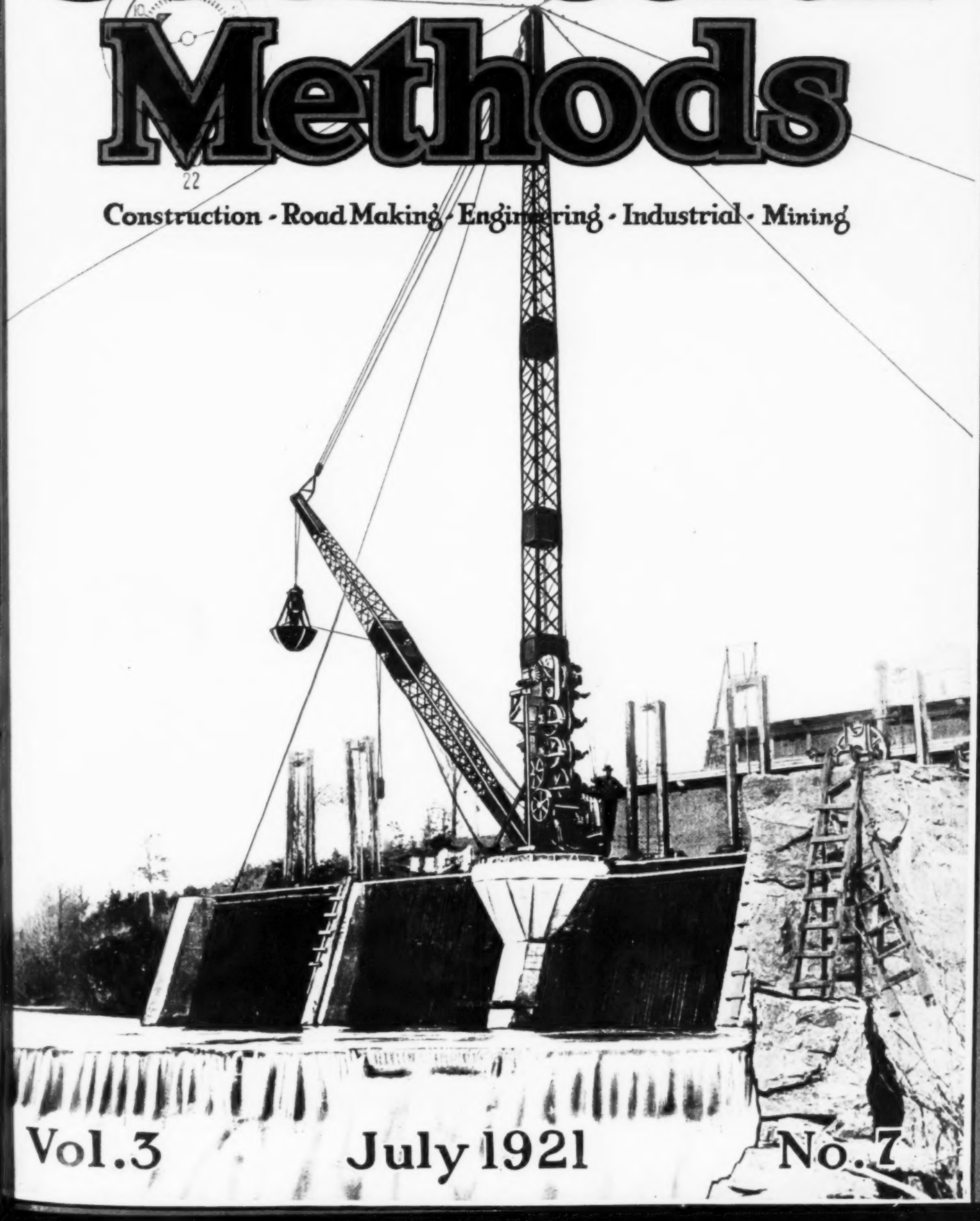
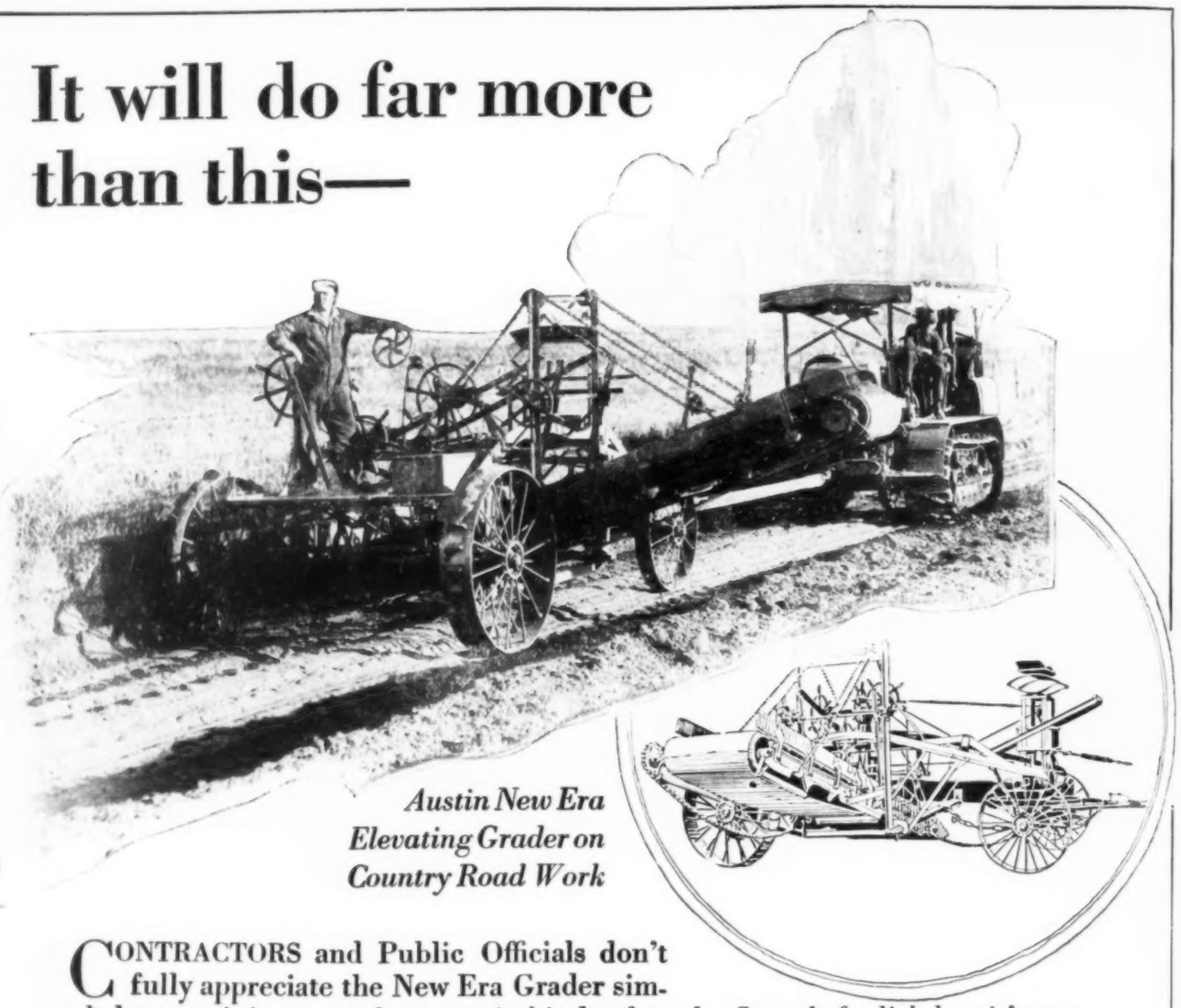
Successful Methods

Construction - Road Making - Engineering - Industrial - Mining



Vol. 3 July 1921 No. 7

It will do far more than this—



Austin New Era Elevating Grader on Country Road Work

CONTRACTORS and Public Officials don't fully appreciate the New Era Grader simply because it is too good on certain kinds of work. Sounds foolish but it's true.

The New Era has been used so extensively on railroad and levee work and for the construction of new roads in certain sections of the country that most people overlook entirely the fact that it is just as big a time-and money-saver on many other kinds of jobs.

The New Era's duty is to move dirt, and it isn't particular about the reason for wanting it moved, consequently new uses are constantly being found for this most efficient of all earth movers. Take the old problem of clearing out the ditches of gravel and other hard surfaced roads—it's no trick at all for the New Era.

The New Era won't work on a sidewalk and it won't load water; but when, after an examination, we say that it is the thing for you, your old ideas about earth moving costs are going to get a jolt.

Don't jump to the conclusion that you can't use a New Era. Give us a chance to show you that you can't afford to use anything else.

AUSTIN MANUFACTURING CO.

NEW YORK CHICAGO SAN FRANCISCO

Canadian Agents:—Mussens, Limited—Montreal, Toronto, Vancouver
Canadian Fairbanks-Morse Co., Limited—Winnipeg, Calgary, Saskatoon

EXPORT DEPARTMENT
ALLIED MACHINERY COMPANY OF AMERICA

Successful Methods

A Magazine of Construction Service

Published by SUCCESSFUL METHODS, Inc.
F. A. SMYTHE, President
S. T. HENRY, Vice-President and Treasurer WILLIAM JABINE, Secretary and Editorial Director
141 Centre St., New York City, N. Y.

Vol. III JULY, 1921 No. 7

What's Ahead?

CONTRACTS awarded for construction work since April 1 have increased steadily in volume. Railroad improvements remain at their lowest ebb over the entire country. There is almost no industrial plant expansion. But building jobs are being let in increasing amounts. Road and street improvements under way grow monthly at a surprising rate. Money seems easily raised for public works. The funds for general building operations also are more plentiful.

On the whole, the outlook for the construction industry is not any too good. It is far better, however, than is the situation in most of the other important lines of business.

Moving Dirt with Sentiment

THE construction business is a strenuous occupation under the most favorable conditions. Men go into it chiefly with the hope of financial success. They do not endure the hardships nor take the risks which the business involves merely for the joy of the job. And, still, there is much more sentiment toward their work among successful contractors and construction engineers than is generally recognized. In fact, the pride of a thing well done is undoubtedly as great a motive to the men who have made good as dirt movers and builders as is the mere money reward.

Unfortunately, there are some men who can skin a job every time they get a chance and still keep in the contracting business. Even an occasional construction engineer in charge of work for a corporation does not always make a good job, economically done, his primary object. Such cases are the exception. They necessarily are so. Men cannot succeed permanently these days except by doing good work at reasonable cost.

It is not this demand for good results, however, which alone prompts the really big men in the construction business to put their best into their work. It is an inborn pride of accomplishment in such men as Carey, Winston, Roach and others of their stamp that is no different from that which inspires the designing engineer, the architect, the physician and all other professional men of calibre.

Probably the hard-headed kind of men who are required to make good as contractors and construction men have unconsciously disguised their sentimental interest in doing a good job. Maybe sentiment to them smacks too much of poetry and long-haired artists. Be that as it may, the sentiment or the pride of the job or the ethics of the profession, or whatever handle you want to give it, is solidly in the hearts of the really big construction men. If they themselves would permit those for whom they work to recognize it a bit more, there would be much gained all around.

British Labor Efficiency

BRITISH newspapers frequently state that the American miner is three or four times as efficient as the British mine worker. They base their conclusions on the fact that the average output per man in this country is about 800 tons a year, while it is only about 200 tons in Great Britain.

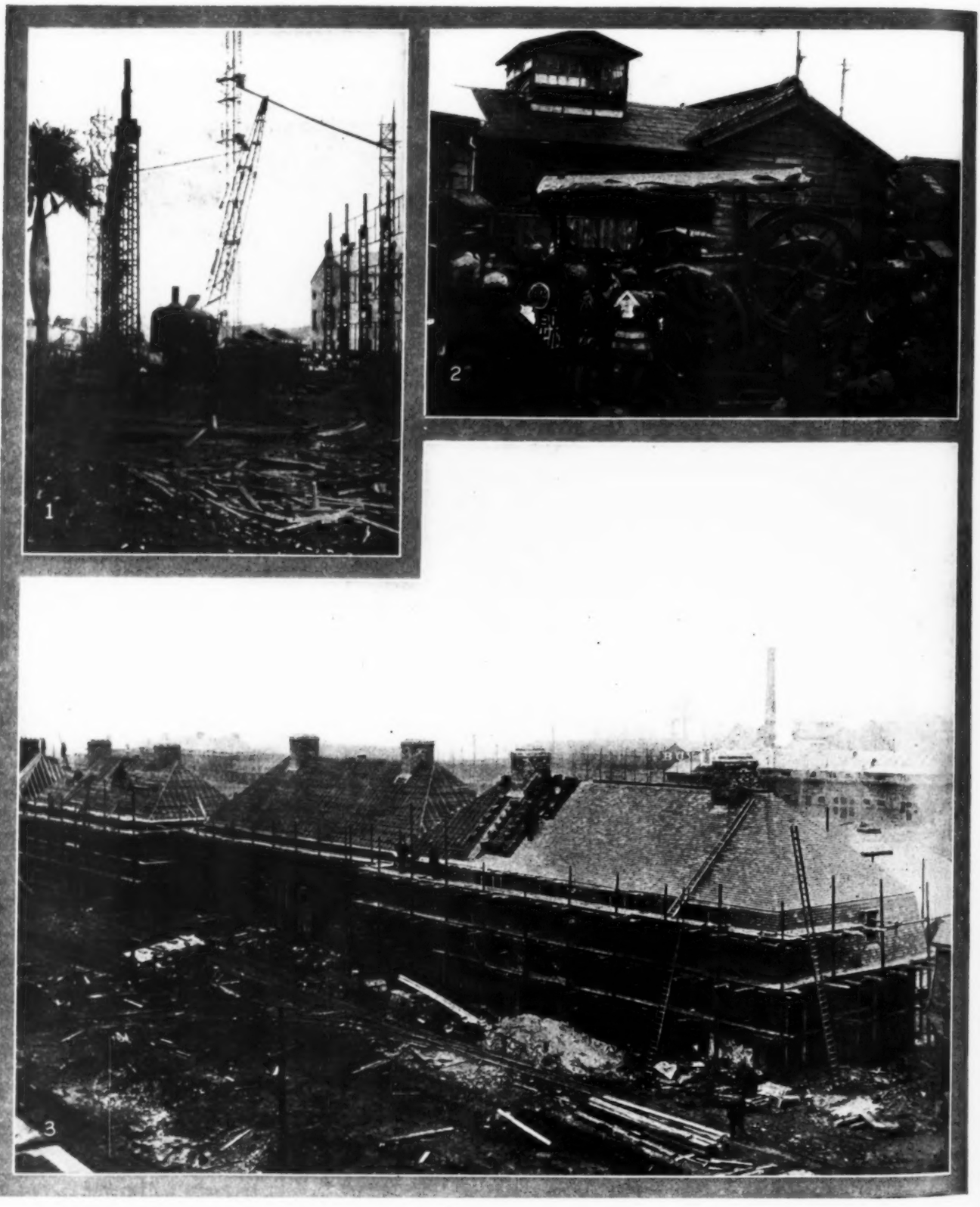
On the face of it the difference in labor efficiency seems apparent. But there are many factors which are at least as important as the relative efficiency of the individual worker. The most evident of these is the equipment and machinery provided in the mining industry in Great Britain as compared with what American mine owners have installed. It appears, indeed, that the better mechanical facilities of American mines are, directly and indirectly, more largely responsible for the greater output per man in this country than all other factors put together.

British mine equipment notoriously is behind the times. The British miner has consistently opposed the installation of machinery which would reduce the amount of labor required per ton of output.

Most American coal mines are equipped with modern machinery which reduces to a minimum the manual labor required. Progress in the development of mining machinery of all kinds in this country has, in fact, been somewhat ahead of what has been done here in many other mechanical lines. Unreasonably high wages have been the greatest stimulus to this development.

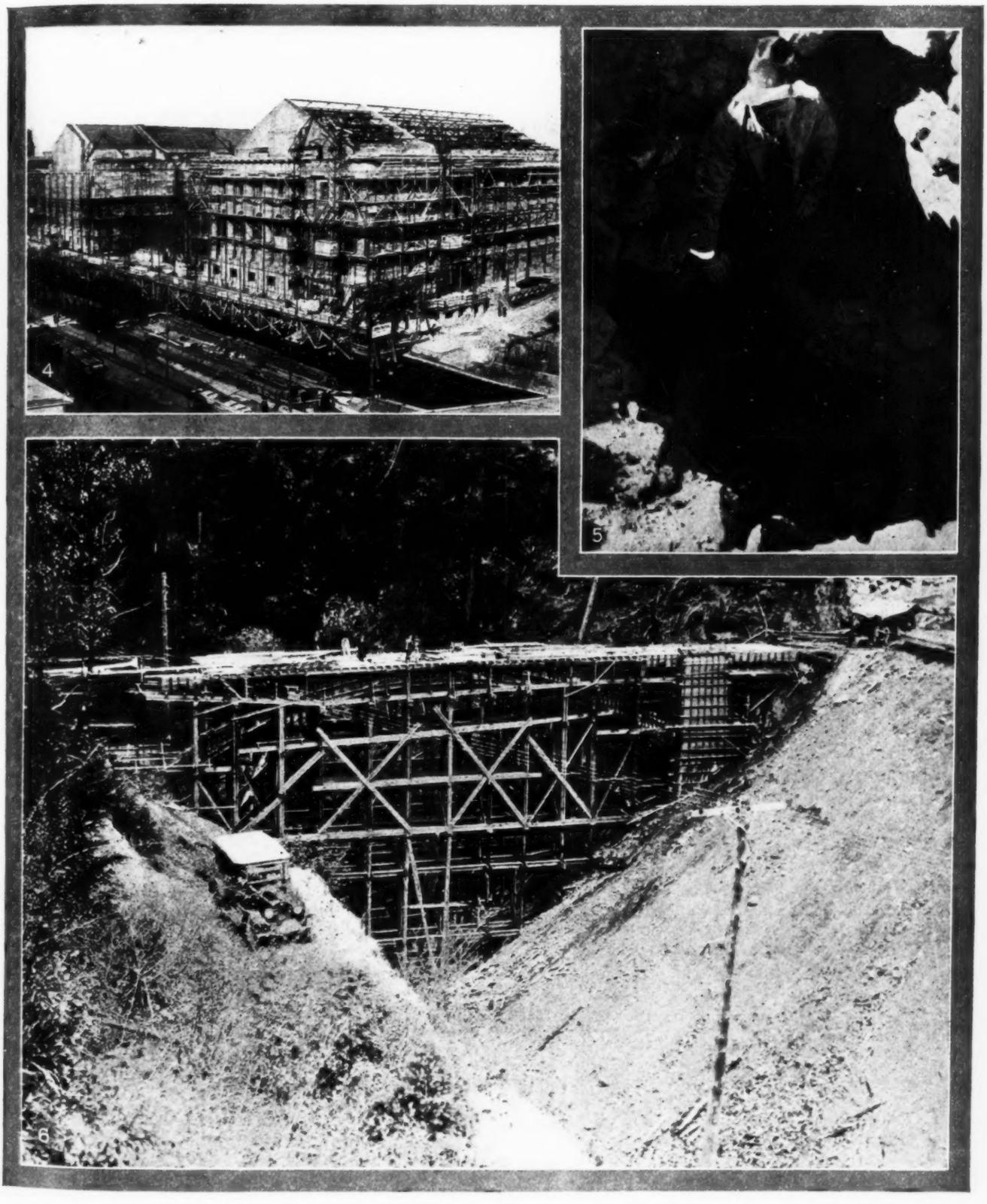
In many other industries in which the extensive use of machinery is possible, the output per American workman is relatively as high as it is in the mining of coal. The maximum use of the most modern machinery available is the answer. And still, in this country we hear now an occasional construction man talking about cheaper labor making less machinery necessary. If ever there was a time when labor efficiency on construction work had to be multiplied by the use of machinery that time is now when competition is forcing jobs to be taken at mighty narrow margins.

Keeping Pace with Construction



1. American machinery building a sugar mill in Cuba.
2. The arrival of a steam roller from the United States is an event of no small importance in Japan.
3. England is making real progress in improving the housing situation. This photograph shows part of a town at Bellingham, Kent, in which 2,056 houses, two schools and two large markets are to be built. This work is at present furnishing jobs for 11,000 men. © *Keystone Views.*

In Six Corners of the World



4. Germany is going in for art museums these days. The two shown in this photograph are being built on an island in Berlin. © *Keystone Views.*

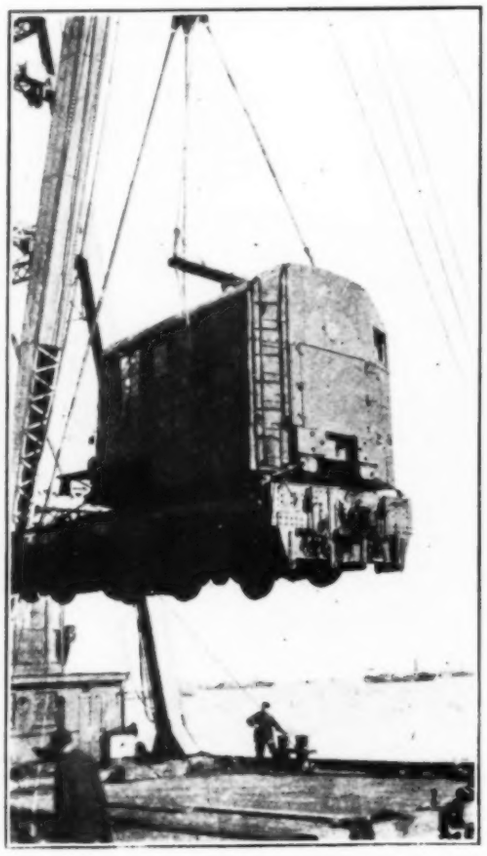
5. The Old Oaken Bucket will never see this well. The result of a "tiro grande" (big shot) in the nitrate fields of North Chile where no rain has fallen in hundreds of years.

6. The building of bridges is an important feature in carrying out the American highway program. The bridge under construction shown in this photograph is in Oregon. © *International.*

FIVE MILES OF MUNICIPAL PIERS

New York Is Adding to Its Harbor Facilities on Staten Island Shore

IN New York Harbor, looming up in the maze of shipping of all descriptions, there are now under construction $20,000,000 worth of new piers and sheds belonging to the City of New York. In 1919 after satisfactory leases had been arranged with responsible steamship companies, the Commissioner of Docks was authorized to proceed with the plans and construction of 12 piers and sheds and bulkhead wall which will provide 5 miles of docks or berths for 48 freighters. The piers, which are located on Staten Island, are shown in the general plan below.



PICKING UP A 30 TON LOCOMOTIVE CRANE

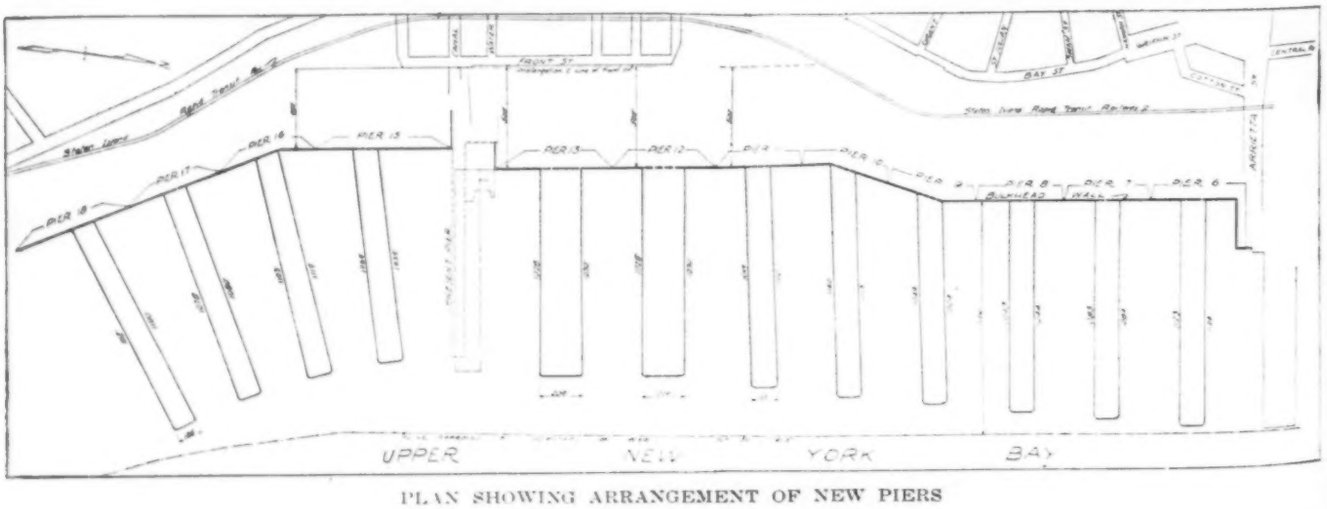
Of the twelve piers and sheds, eight are 125 ft. wide, two 130 ft. wide, two 209 ft. wide, with an average length of from 1000 to 1150 ft. The slips are all approximately 300 ft. wide. The piers consist of a heavy reinforced concrete deck on wood piles. Eight of the piers are to have one-story steel sheds, while the remaining four are to be two-story steel structures with heavy reinforced concrete second floors. The sheds are to have a center and two side aisles. In the center aisle there will be a standard gage track for the entire length. The type of shed on piers 12 and 13 (209 ft. wide) is different from the others, in that they are provided with wide platforms on each side which carry standard gage tracks.

The timber piles which support the deck vary from 50 ft. in length near the land end to 90 ft. for the outer portion. The long piles are lagged with four sticks of 5 by 6 timber, 30 ft. long, bolted to each pile.

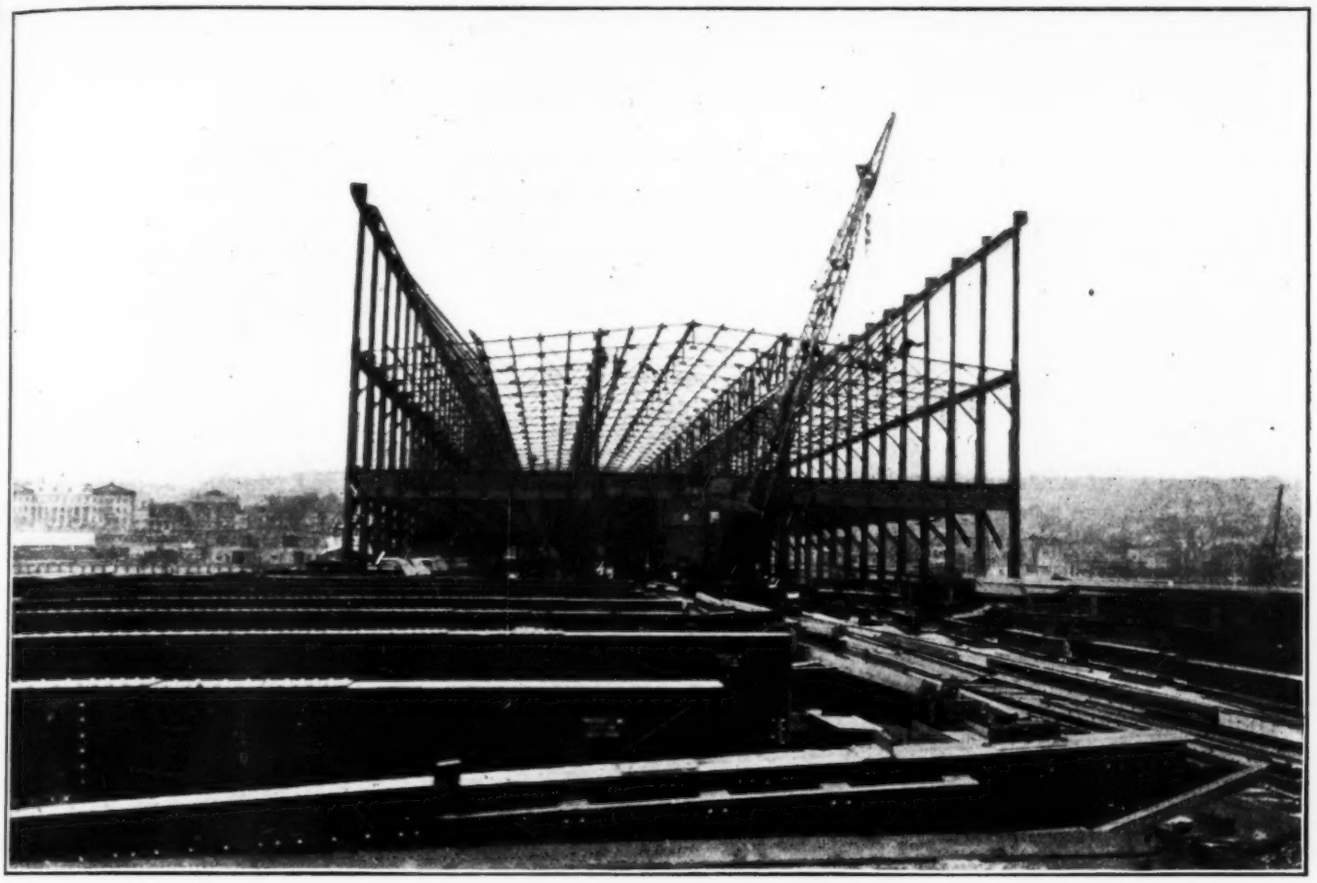
The concrete deck and bulkhead wall are now practically completed. Various means of placing the concrete deck on the timber piles were used, one of the most effective being a floating concrete plant consisting of a mixer, elevator, chutes, bin, hoppers, etc., mounted on a scow.

One of the photographs shows the manner in which Charles Welker of the McClintic-Marshall Co. is erecting the steel sheds on piers 15 and 16. The 30-ton locomotive crane shown in the photograph was floated to the pier on a railroad float, picked up by a wrecking derrick and placed on a standard gage track running full length to the center aisle. The crane, which has an 85-ft. main boom, is shown with a 20-ft. jib extension, equipped with truss rods to handle 6 tons at a distance of 65 ft. out. This extension makes it possible to place steel work, which is 76 ft. high from the deck to the top of the cargo hoist beam.

To facilitate the speed of operation, no blocking was used under the outriggers at each stop. Instead, a 12 by 14 timber, 30 ft. long, which engages two of the outriggers on each side so fixed as to clear the concrete deck by 4 in., is used. When setting a heavy girder oak wedges are placed under this timber to prevent the crane tipping or upsetting. When the steel on pier 15 was completed the crane was again picked up by the wrecking derrick as before, and landed on pier 16. The steel in sheds on piers 15



PLAN SHOWING ARRANGEMENT OF NEW PIERS



LOCOMOTIVE CRANE WITH 20-FT. JIB EXTENSION TRUSSED TO HANDLE 6 TONS AT A DISTANCE OF 65 FT. OUT

and 16 amounting to 6500 tons was set in this manner in a short space of time.

The last word in cargo handling machinery and devices will be installed. Piers 12 and 13 will have revolving half gantry electric cranes, 17 to each pier. The other piers will be equipped with electric winches and cargo masts. The two-story sheds will be equipped with cargo chutes and 40,000-lb. elevators for 10-ton trucks. The cost of the cranes will be about $500,000, and the electric winches $200,000. When the piers and sheds are in complete operation they will be able to handle approximately 11,000,000 tons of freight in, and 11,000,000 tons out annually.

Work was started in the spring of 1920, and the piers will be ready for operation in the fall of 1921. The general contractors for the piers are: Piers 6 to 11, Terry-Tench Co.; 12 and 13, Smith, Hauser & McIsaac; 15, George B. Spearin, Inc.; 16, Snare & Triest Co.; 17, Barth S. Cronin Co.; 18, Phoem Construction Co. The general contractors for the sheds are: 6 to 11, Bethlehem Steel Bridge Co.; 12 to 13, Post & McCord, Inc.; 15 and 16, Snare & Triest Co.; 17 and 18, McHarg Barton Co. T. F. Keller, as chief engineer of the Commission, was in charge of preparation of all plans as well as construction.

The conception and carrying out of this project, the magnitude of which vastly exceeds anything of the kind ever attempted in New York Harbor, is due to the energy and initiative of Murray Hulbert, Commissioner of Docks of the City of New York.

THE PICTURE ON THE COVER

THE derrick shown on the cover is a permanent installation owned and operated by the Southern Public Utilities Company on its dam at Gregg Shoals, about 25 miles from Anderson, S. C. There is a great deal of silt continually flowing in the stream from which the dam is built, and in several years it fills up the pond and banks up against the racks.

It was decided that a derrick equipped with an orange-peel bucket would be the best method for cleaning the racks and it has proved satisfactory, as it enables the operator to keep the forebays clean and to provide a free path to the water wheels.

It also does away with a good deal of the raking of the racks, which is necessary during high water to clear them of leaves and trash. A special rake is being devised to attach to the derrick to do this part of the work.

The derrick is self-contained. The engine is electrically operated and is built into and forms part of the derrick mast.

PROPER OPERATION OF POWER SAW RIGS

Some Pointers That Will Aid Builder on the Job

THE builder employing a portable saw rig or woodworker on the job should know the proper care and operation of equipment of this machine, so as to get the best results from it with the least repairs and expense.

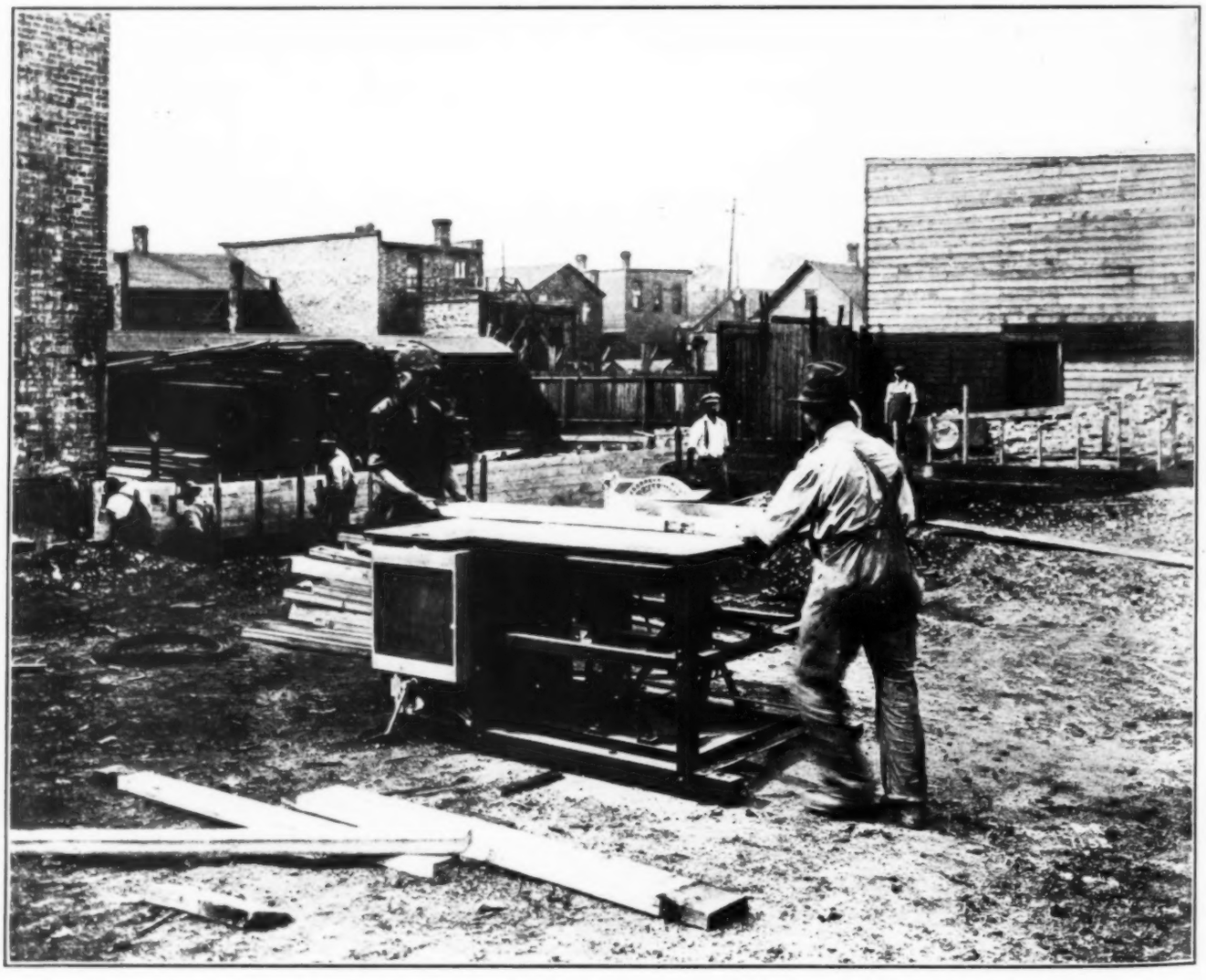
First of all, such machinery needs care. Many builders are inclined to leave their machines exposed to rain and snow for a week or more without protection. How they expect to get full efficiency out of a machine treated in this manner is hard to understand.

The operation of a saw with power, gasoline or electric, is no more dangerous than the use of an ordinary hand saw—that is, provided the proper precautions consistent with the operation of power-driven machinery are taken into consideration. Manufacturers of these machines provide all practical safety devices essential in their operation.

One of the most dangerous things that the saw operator can do when ripping lumber is to attempt to remove edgings or slivers which may have become lodged in the saw groove or throat of the saw-table while the saw is in operation. Flying knots or chips from the saw should be guarded against. No saw should be operated unless properly equipped with proper guards. The saw-guard should always be set low enough to let only the stock pass easily under it and far enough forward so that the operator cannot see more than about 2 in. of the revolving saw.

Another danger to guard against in the operation of the saw is the so-called "kick-back." To avoid this a spreader is usually placed directly back of the saw. However, much cross-cutting and ripping is being done alternately on the saw during a day's run. Moreover, the spreader back of the saw does not always work to the best advantage when doing cross-cutting or mitre-cutting, and some machines are not equipped with this safety device. Therefore, the operator must be on his guard constantly.

Kick-backs while ripping generally occur when no spreader is used back of the saw, and warped stock is forcibly thrown back by the centrifugal force of the saw, generally striking the operator in the abdomen and often causing serious injuries. Running



warped stock, however, is not the only cause of accidents of this nature. Some of them are: Using spreader that is thinner than the saw; attempting to operate the saw with insufficient set, causing the stock to bind and kick back; using too small a saw; operating with the saw-table set too high; leaving too small a portion of the saw exposed.

Another bad practice which one often sees among men operating power saws on building jobs is that of setting the saw so that it just cuts through the stock. A saw ripping 1-in.-thick stock, when set in this manner, has a tendency to drive the stock back at the operator. This is the case especially if it has teeth of 1 in. pitch. These teeth strike at such an angle that three of them are engaged at one time, making the stock extremely likely to kick back. A saw set at the proper height for ripping only engages one or rarely two teeth in the lumber at a time, thus the cut is made with less power, and the tendency to draw the stock through, rather than drive it back at the operator, is helped along. The setting and filing of the saw also are important.

JUGGLING RED HOT GLASS

Portable Conveyor Aided by Running Water Handles Job Without Trouble

HANDLING red-hot glass seems like an impossible job for a belt conveyor, but it is being done at the works of the Libbey-Owens Sheet Glass Co. at Charleston, W. Va. By using the conveyor an operation which used to require 120 hours has been reduced to 60 hours and considerable hand labor has been eliminated.

The conveyor is used to empty glass tanks which have to be drained occasionally in order to repair them. Formerly the custom was to use wheelbarrow gangs, but this method was unsatisfactory because the glass cooled rapidly in large masses and had to be broken by hand afterward.

When it was decided to try the conveyor the main problem was to keep the rubber belt from being burned by the red-hot glass, and in order to do this a perforated pipe was mounted over the center of the belt. Water is sprayed directly over the entire belt through this pipe and keeps the belt from burning. The operation may be described briefly as follows:

The molten glass flows from a hole in the tank on to a steel pan conveyor, 40 ft. long, into which water is sprayed. From the end of the steel conveyor it falls on the belt of the portable conveyor, which is shown in the photograph which accompanies this article. When the glass first comes out it hangs together in strings 3 or 4 ft. long. These strings are broken partly by the action of the cold water and completely by the fall from the discharge end of the portable conveyor. The water on the belt flows at a regular speed, so that the glass always is kept wet. As much water as possible is kept on the belt. R. P. Callard of the Libbey-Owens Company says that no lumps larger than 2 in. in any dimension can be found after the operation is completed. He writes:

"Our main trouble has been with belts. We originally were of the opinion that a plain belt would be best, but the canvas belts are not good, losing their shape quickly and wearing out quickly in the hot water and abrasive glass. The belt we now have is six-ply canvas, rubber impregnated and has emptied two tanks and will last many more."

SOME FACTS ABOUT RECONSTRUCTION IN FRANCE

Frenchmen Are Doing Most of the Work with Hand Labor

Immediately after the armistice, a civilian American construction engineer went over most of the devastated areas in France. This man recently made another trip over more or less the same areas. Both trips were in the interests of an American machinery company which does an extensive business in Europe. The following is an extract from this engineer's report to his home office:

"AS you probably recall, when I was in France, just after the Armistice, I spent several days with the officers of the Second Army at Toul. During that time we travelled by automobile and on foot

A STREET IN VERDUN

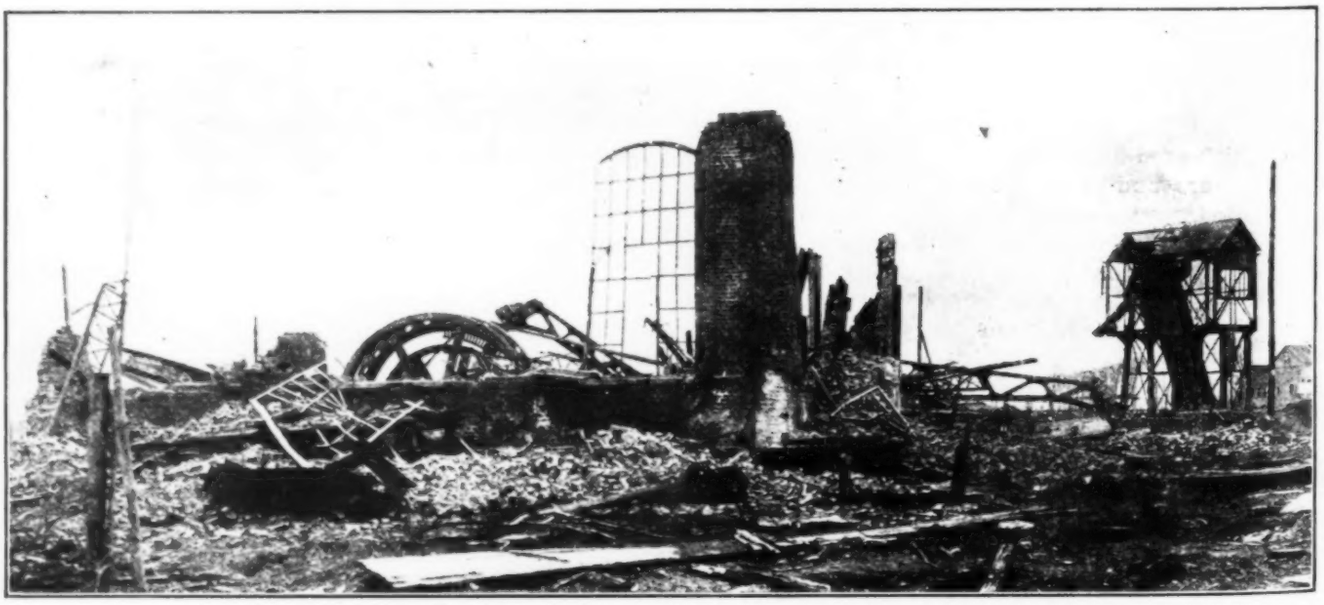
pretty much all over the battle area from Verdun east. A little later I had several days with the Twenty-third Engineers, U. S. A., when they were located near Bar-le-Duc. At that time the adjutant and some of the other officers took me up and down and across the devastated area from Verdun to the Belgian border. I was, therefore, fairly well acquainted with this section as it stood immediately after the Armistice.

"In view of your recent instructions to report conditions exactly as they are, I decided to visit the devastated areas again personally before complying with

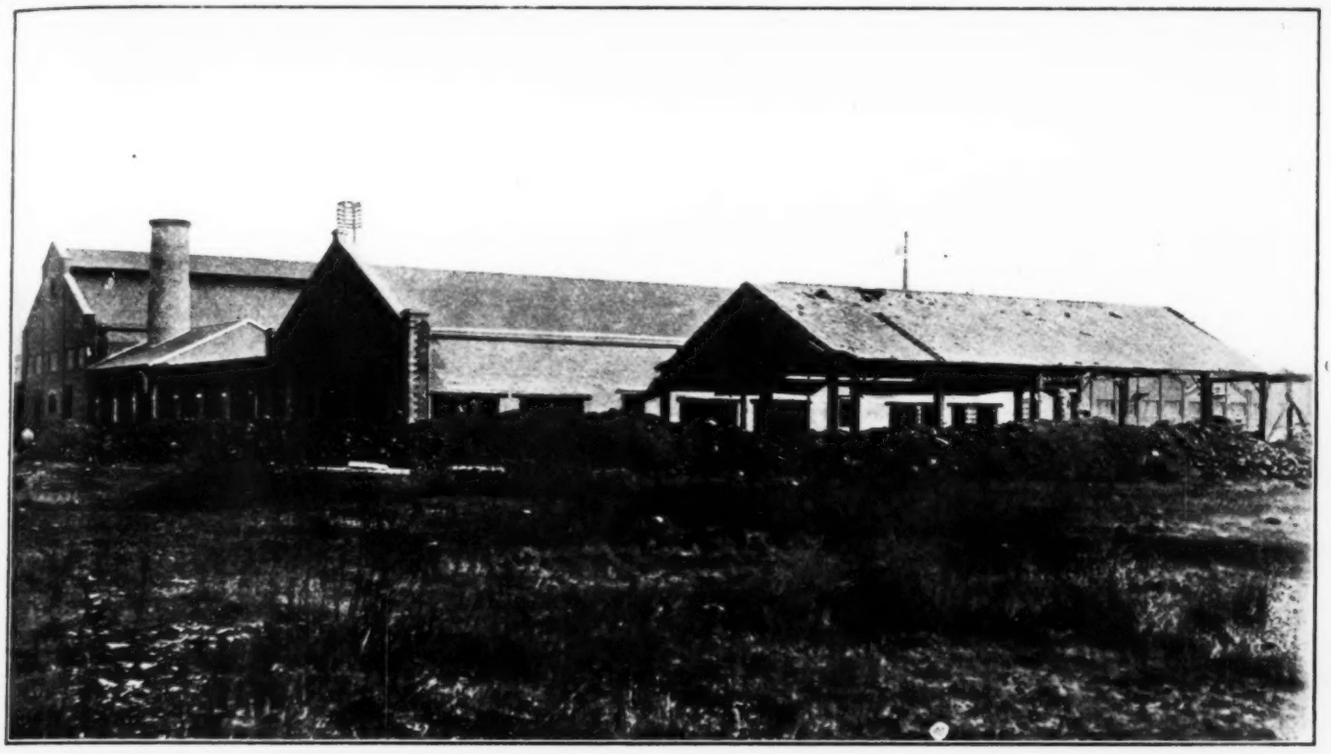
THE RAILWAY STATION AT FISMES

your request. I considered it best not to take hearsay or local accounts. I am especially glad that I did not undertake to answer your letter without making a personal investigation, because I was dumbfounded at the enormous areas which I remember as absolute deserts two years ago and which are now under cultivation.

"When I made my first trip the whole situation appeared to be a very hopeless-looking proposition. I conceived the idea from my contact with various people whom we met and talked to at that time that the natives were left absolutely dazed by their experience. The general idea there was that the younger men who



WHAT WAS LEFT OF A FRENCH POWERHOUSE AFTER THE GERMANS PASSED



AN EXAMPLE OF RECONSTRUCTION. A GLASS FACTORY AT MAUBEUGE REBUILT BY AN AMERICAN COMPANY. THE CENTER BUILDING IS A MIXTURE OF OLD AND NEW WORK

had not been killed in the war were not inclined to buckle into their job of reclamation with anything like sufficient energy to overcome the obstacles with which they were faced. In other words, I was then led to believe that the people of the devastated area had been "kidded" with the idea that the Germans would be compelled to pay in full for all of the havoc that they had wrought. They were supposed to assume that the French government would see to it that things were put right without any effort on their part. It actually is true that many of them certainly appeared inclined more or less to sit still and wait for someone else to come and hand them a living.

"What has been done in the last two years shows that such conclusions were entirely without foundation. I was very gratified to find most of these people in the northern section of France hard at work from very early in the morning until late at night. There were no "union hours." First they had occupied themselves in getting their land ploughed and planted. Then they had rebuilt their houses so that they would have some place in which to live other than the little wooden huts which had been provided for them.

"It is perfectly marvelous to find many stone houses where whole walls had been replaced. In practically all such cases the stones which were ripped by shell-fire have been carefully removed and replaced without disturbing or destroying the original wall. The manner in which this is done would be a source of wonder to any American engineer. In fact, throughout most of the towns it would have seemed to us Americans, at the time of my first trip, that the best thing to do would be to go in with steam shovels and rip out the whole thing and take a fresh start. But not so for the Frenchman. Where a shell has gone through the side of a house he has gone up and measured it very carefully, taken out the stones which were actually shattered and replaced them with new stones very carefully cut to fit. All this has been done without in any way disturbing the surrounding wall. The same thing applies to roofs. We even found numerous houses where all but one wall had been destroyed, and the house to-day stands absolutely rebuilt with that one wall in its original place.

"Approximately the same sort of work has been done in the farming lands. In those fields in which the soil was actually blown away or mixed with the subsoil, shellholes have been carefully and laboriously refilled, one at a time, by hand. In the sections nearer the fighting lines a number of the landowners have grouped together to straighten up their fields one at a time. Here, again, practically all of the work has been done by hand. The worst sections, where the havoc was complete, have generally not yet been touched. The total areas thus left are limited. Even in them considerable land reclamation has been done by small contractors.

"The physical conditions mentioned offered almost insuperable obstruction to going at this work with modern American dirt-moving methods and machines. You must bear in mind, also, that these little villages are poor. Furthermore, the amount of money allotted to any one area by the government was almost negligible, when compared with the total amount of work which they had to do. The French have taken all these factors into proper account. They have done wonders in reclaiming the great areas which were so sadly torn by war. Regardless of press reports you may see or of what American engineers may think of the methods used, the French have achieved these results in spite of financial and other handicaps which seemed insurmountable two years ago."

NEW YORK'S DUAL TYPE ROADS

Two Concrete Strips with Macadam Between Solve Many Problems

A PLAN developed by the Commission of Highways, State of New York, which permits easy reconstruction of old macadam roads and at the same time does not interfere with traffic, consists of two strips of concrete road, each 9 ft. in width with a 6-ft. strip of penetration macadam between, known in the department as the dual type of road. A typical cross section is shown.

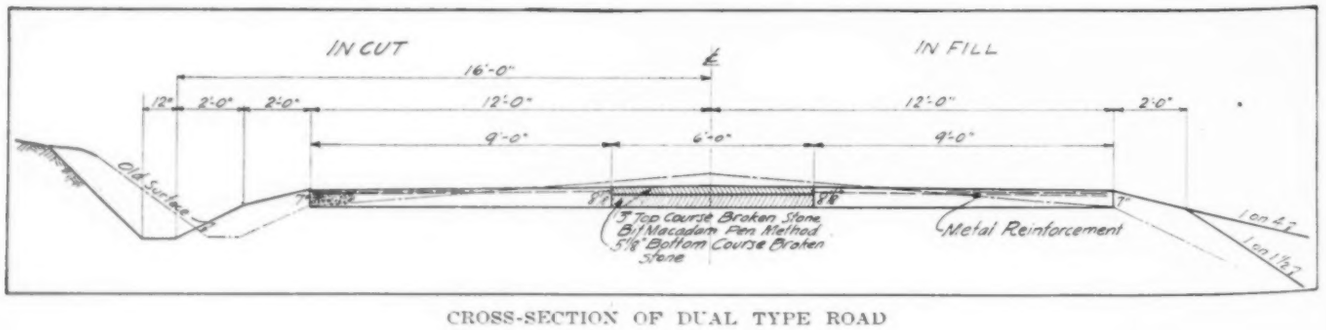
The main advantages of this type of road are: 1. That 99 per cent of the traffic is carried on concrete roadways, the macadam being used to allow fast traffic to pass. 2. They are rebuilt and maintained with a minimum amount of inconvenience to the traffic, one strip always being in operation. 3. The two fast strips are separated by a center line of safety; the difference in color of the concrete and macadam indicates the fast and slow strips. 4. The macadam receives only the lighter traffic. As for the cost, at the present time this type of road is being estimated at $40,000 per mile.

In New York State the gravelly nature of the soil permits easy shoulder construction equal to the old macadam. Judgment must be used, however, in deciding if the old shoulder is suitable for a foundation adjacent to the old roadbed.

One of the main ideas of this type of road is to disturb the existing macadam as little as possible when it is in good condition.

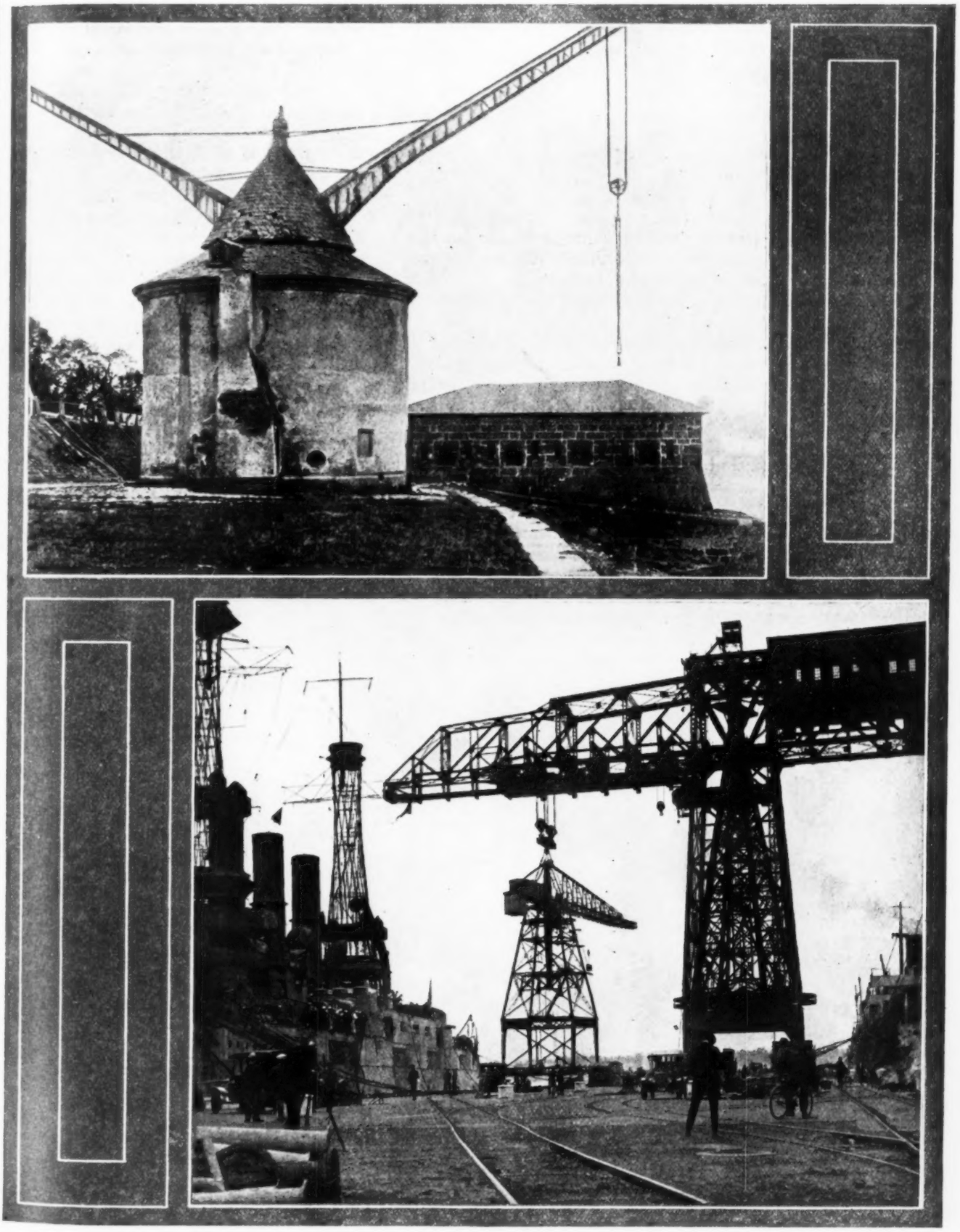
The above photograph shows how an old macadam road in Albany County, New York, which was ruined by frost boils, was transformed into the dual type. This type of road is not offered or recommended by the Commission of Highways as a cure-all for road renewal of all sorts. In New York State the soil is of a gravelly nature which makes the widening of a satisfactory shoulder comparatively easy and inexpensive, and the roads which have been rebuilt in this manner have been roads carrying heavy traffic. The width of 24 ft. is, of course, another advantage of this type.

The State Highway Commission of New York is rather partial to this type of pavement where conditions warrant, and at the present time a considerable amount is under construction.



CROSS-SECTION OF DUAL TYPE ROAD

The Oldest and the Biggest



The upper photograph shows what is said to be the oldest crane in the world. It is at Trier on the Moselle River. A document in the city archives states that the crane was built in 1413. It is still in use. © *International.*

The biggest crane in the world is shown in the lower photograph engaged in the interesting job of lifting and moving another crane which itself is entitled to be called big. These two cranes are at the League Island Navy Yard. © *Underwood & Underwood.*

A WELL ORGANIZED HIGHWAY DEPARTMENT

Pennsylvania Distributes Duties Among Five Divisions

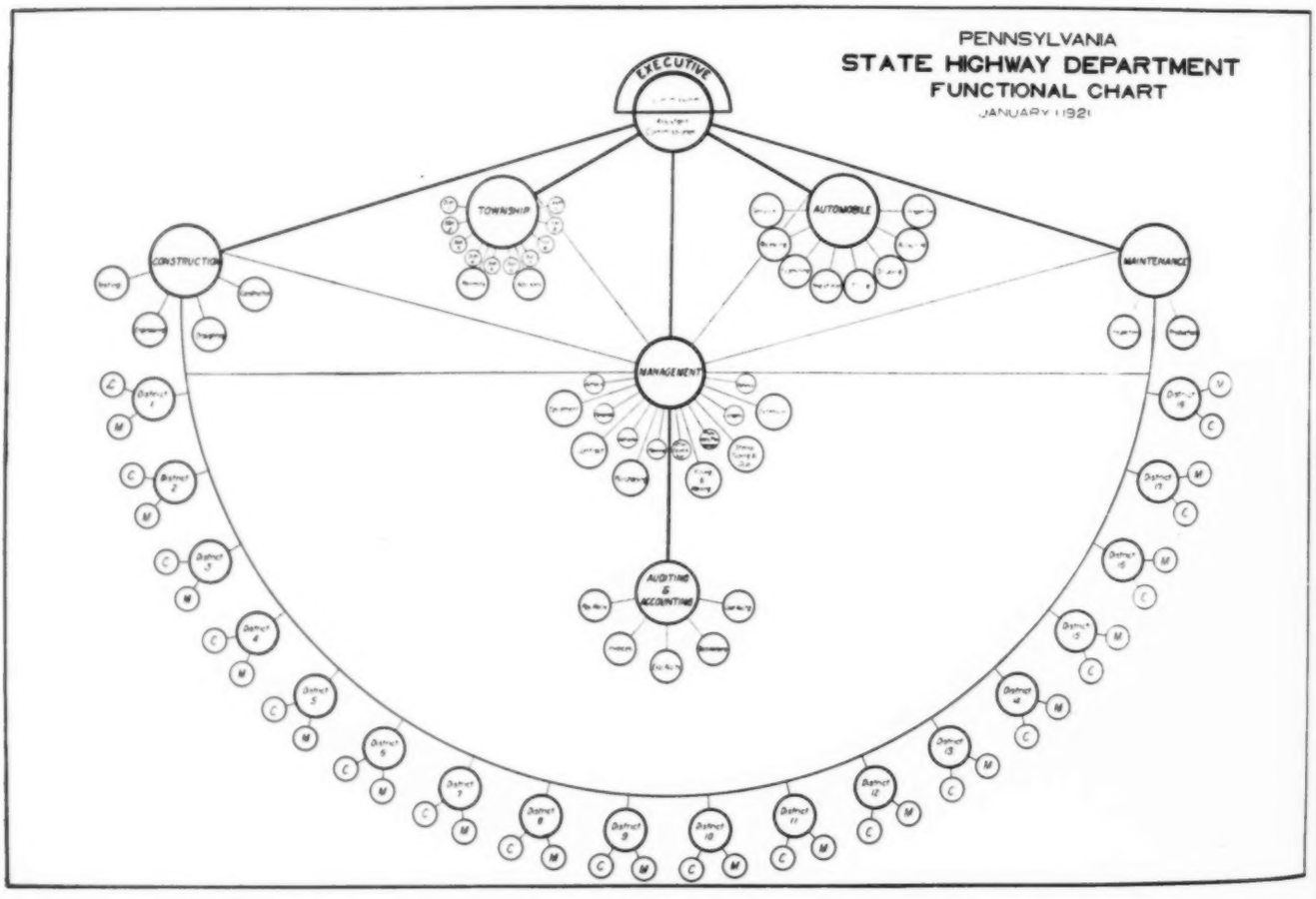
THE Commonwealth of Pennsylvania is one of the foremost states in the Union in the construction of hard roads. An idea of the vast amount of work which is handled by the State Highway Department may be gained when it is understood that at the present time approximately 700 miles of road are under contract and 50 miles of additional roads are under construction by State forces. Thirty-three additional projects have just been advertised.

The magnitude of this work is at once apparent, and in order that other highway organizations, contractors and others interested in the manner in which the State, through its Highway Department, carries on, the functional chart of the Highway Department of the State of Pennsylvania is reproduced and described.

The fundamental principle of the organization is that the duties and responsibilities of each unit are definitely determined and defined and properly correlated to each other. There are five divisions in the department — namely, Executive, Construction, Maintenance, Township and Automobile—to each of which is delegated the duty of performing some particular service not common to the others.

The Executive Division, which is composed of the commissioner, Lewis S. Sadler, and assistant commissioner, Geo. H. Biles, is concerned entirely with the question of policies of the department. Acting as a clearing house, through which all the policies of the Executive Division may be reduced to standard procedure and considered as the operating branch of the Executive Division, is the Management Division. In order that there may be no duplication of effort or other lost motion in the five divisions, and that each division or bureau may be left free to handle its particular work, it is vital that there should be some clearing house for the elimination of friction and the correlation of their activities. The furnishing of this liaison is one of the principal functions of the Management Division.

At this point a study of the chart will serve to clarify the sort of service which the Management Division renders to each of the five principal divisions. It will be seen that the equipment, contract, purchasing, filing, mailing, typing, extension or statistical, as well as the auditing and accounting, are handled by the Management Division for each of the five principal divisions. It will be readily understood that in work of such magnitude, in order that the accepted procedure in handling all new problems may become a part of the general scheme, it is necessary that the Management Division be in close touch with all department conferences upon investigation and research work. It is of particular advantage that results of the work of any one division be made available for the rest of the organization. In the compiling of



statistics the same idea holds good: that a central point or division shall act as a bureau for the compiling of such statistics. The Purchasing, Contract Bureau, Extension Bureau, Filing and Mailing bureaus all are service departments of the Central Management Division, which by their central location are able to render intelligent and efficient service.

By means of the Management Division, with its associated service bureaus, such as have been described, the Construction, Township, Automobile and Maintenance divisions are left free to handle the special features of their particular department. For example, the Maintenance Division, as its name implies, is in charge of maintenance of all state highways and state-aid roads in the Commonwealth, and in this branch of the organization alone there are employed during the working season about 10,000 men.

The Township Division, whose duty it is to act in an advisory capacity to township supervisors, gives them the benefit of experience which has been gained by the department. The assurance of a continuation of the road program is contingent upon the proper education of the public, and in this phase this department's work is most important. Without going into detail as to the function of the Construction Division, suffice it to say that by reason of its being relieved of the duties performed by the Management Division, it is left free to concentrate on the engineering features, such as the making of surveys, tests, preparation and revision of specifications and the actual supervision and inspection of construction work. Col. Wm. D. Uhler is chief engineer of the Construction Division.

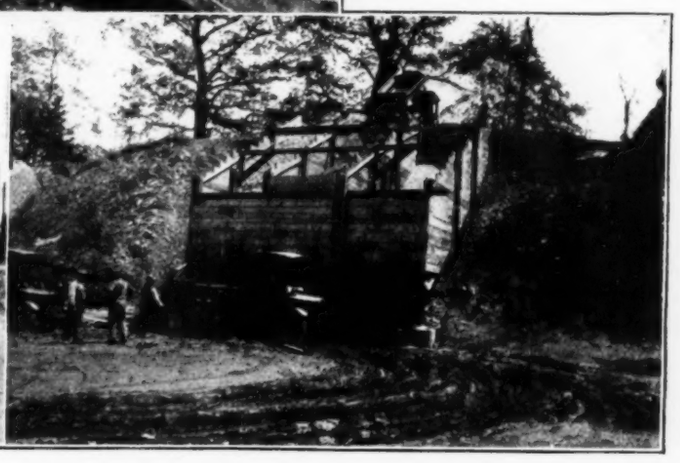
MEETING THE NEW SPECIFICATIONS

UNDER the new 1921 Pennsylvania highway specifications no materials, with the exception of cement, may be stored on the subgrade. Another change in the new specifications is the increase in weight of the reinforcement. The way Vincenzo Di Francesco, who has a contract for 12,077 ft. of 18-ft. concrete road on the Westchester Pike, just west of Philadelphia, is adapting his plant to meet the 1921 requirements is shown in the accompanying illustrations.

The upper picture shows the cement placed along the subgrade as required by the specifications. Di Francesco has devised a sort of box culvert with handles on each end as a platform for his cement. At night the cement sacks are covered with tarpaulins, and in case of rain, the water drains through the box on which the cement rests instead of wetting the lower tier of sacks.

His compartment truck, also shown in this picture, is a home-made rig holding two batches. The body is divided to hold the proper amount of sand and stone and when the truck is dumped, the tailgate automatically releases the first batch. The division between the sand and stone is free to swing as shown. The gate releasing the second batch is operated by the lever. All the gate operators may be removed without any damage to the truck.

Another home-made device is that of the reinforcing straightener which is shown in the lower left-hand picture, consisting of three steel rollers mounted on a wooden frame. The roll of reinforcing is carried on a spool and a team is used to pull the reinforcing through the rolls. The material bin and the manner in which the trucks are loaded are illustrated in the third picture. Stone is crushed in a nearby quarry by means of two gyratory crushers, and is delivered to the bin by truck. Sand is hauled from Philadelphia by motor truck. The quarry and bin are about a mile and a half from the job.

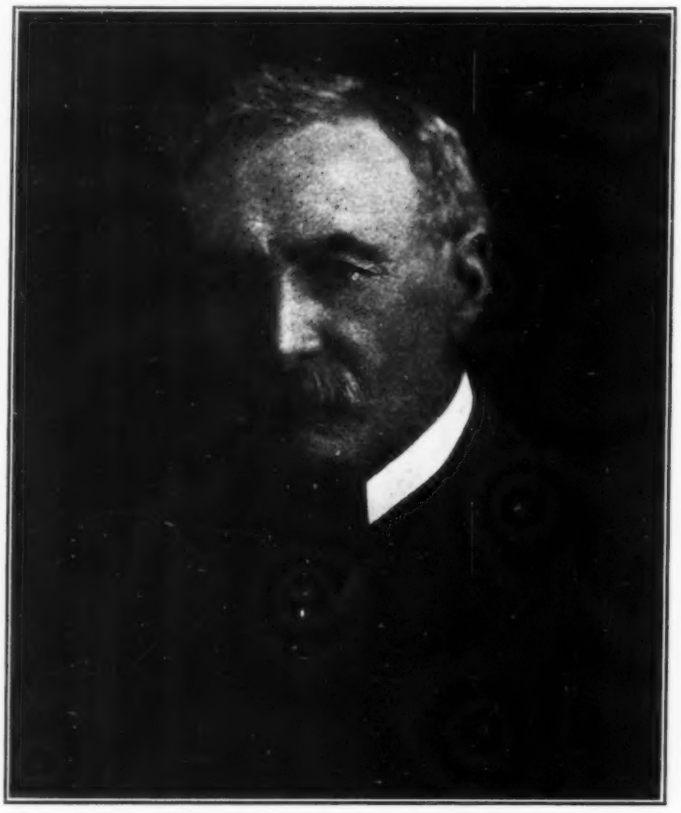


WM. MULHOLLAND—THE LOS ANGELES WATER SUPPLY

By S. T. H.

EMERSON said, "Every business is the measure of the shadow of a man," or words to that effect. This statement was never better illustrated than it is in the case of the great business of supplying an adequate quantity of good water to that remarkable region known generally as the Los Angeles District of Southern California. The man is William Mulholland. And a really big man he is, when measured by his works or by any other standards.

Back in the early eighties, when Mulholland reached Los Angeles, the city obtained its water supply from an irrigating ditch. In those days the water thus diverted from the Los Angeles River was considered quite satisfactory for the half-Mexican frontier town of a few thousand people.



WILLIAM MULHOLLAND

Now Los Angeles has a bountiful supply of wonderful mountain water from the east slope of the Sierras. This is delivered by an aqueduct that extends 290 miles, or nearly as far as from Chicago to Cleveland, across two deserts and over and through two mountain ranges. It has a capacity of over 300,000,000 gallons a day. This great conduit and its auxiliary works are unquestionably one of the outstanding engineering achievements of modern times.

Volumes have been written about the design and construction of the Los Angeles Aqueduct. Practically nothing has appeared in print, outside of Los Angeles, about the man who conceived the scheme, who convinced the people of Los Angeles that the money must be provided, who handled the construction and who is now in charge of the operation. This is chiefly because William Mulholland shuns publicity.

Mulholland is a self-made man in every sense of the word. Born in the north of Ireland, he went to sea as a lad. After eight years before the mast, he landed in Los Angeles in 1881 as a ditch tender on the city water supply. To-day he points with pride to great palm trees which he planted near the intake of the old ditch. Then, as now, he took a great interest in his job, although he was only a pick and shovel man.

When Los Angeles began, in the nineties, to expand like a poisoned pup, it was soon evident that her growth would be limited by her water supply. The boom town became greatly excited. Noted Eastern hydraulic engineers were retained to determine how to get the necessary water. They didn't know Southern Californian rainfall or underground water-supply conditions. They certainly didn't sense the determination back of the community to get an adequate supply of good water. Nor did they foresee the rapid future growth of the district.

Mulholland knew Southern California. He knew there was just so much water to be had locally each year, and that when more than that amount was used the bottom of the pail would soon be in sight. He knew from long personal contact that the pioneer type, which was in the majority in Los Angeles in those days, would literally give their shirts for a water supply that would meet their needs. He also knew that the Los Angeles district had a climate which insured a great influx of population — if the water to make this growth possible could be supplied.

Slowly, patiently, courageously, confidently, Mulholland went ahead on the plans he knew were right. First he set about to get every drop locally that could be had. He built storage reservoirs. He took steps to conserve the surplus of flush times in other ways. He built new infiltration tunnels under the bed of the Los Angeles River. And in 1907, when the last of these tunnels was put into use, he said to the writer, "Now we have wrung the last drop out of the tail of the shirt."

Meanwhile, Mulholland was preparing in two ways for the greater project.

First, and of greatest importance, he established himself like a rock in the confidence of the people who must foot the bill. This confidence, by the way, has grown with the years until to-day William Mulholland's word goes for whatever he asks his people to do.

Mulholland also was working on plans for the big Sierra scheme. Secretly, he spent vacations and leaves of absence studying the source of supply and the routes to be traversed by the 290 miles of aqueduct. Water is so valuable in some arid regions that when a man spits a lawsuit is likely to arise over the water rights. It is about that bad in Southern California, so that even a hint of what Mulholland had in mind would almost surely have resulted in a blocking of the scheme by greedy landgrabbers at the source. Consequently, most of his investigations were made

alone. Often he went by himself through the desert with only a couple of burros to carry his outfit.

Finally, Mulholland was convinced that he had the answer. He knew he could get enough good water to insure the unlimited growth of Los Angeles. But at what a cost—$23,000,000 for 350,000 people! Nearly $750 per capita for a water supply! No Eastern engineer would have considered the thought. Mulholland knew his people. Based on his say-so, the bond issue went through.

Then Mulholland had a stiff problem. It was soon evident that contractors could not take the unprecedented risks of the job for the money available. Mulholland cut the knot. He organized the job and did it with his own forces. And, what is more to the point, he kept within the estimate. One case in a thousand. But Mulholland is that kind of man.

The originality and ability displayed by Mulholland's construction organization has been fully heralded. The answer seems to be that Mulholland knew how to pick and place his men. He brought together such men as Lippincott, McKay and others of their stamp and gave them the authority to handle their own particular work. Here, again, he showed his real bigness by avoiding a one-man organization. Any man on the job could get a hearing for an idea, but the word of each division head went in his division. And back of them all was the inspiration of Mulholland's confidence and Mulholland's ability to help them drive the line of heavy construction across the seemingly endless deserts.

Before the big aqueduct work was done, Mulholland convinced the people of Los Angeles that he could develop enough power on the project to pay the interest charges and retire the bonds. They voted him the money and told him to go ahead. But great vested interests were in the way. Private companies already were supplying Southern California with electric power.

For a little while it looked as though Mulholland had met his match. Without going into what happened, two great municipal hydro-electric plants now operate on the water carried by the aqueduct, because Los Angeles believed Mulholland and backed him.

Some of these days before long Los Angeles will need more water. In fact, the present rate of growth cannot continue much longer unless an additional supply is provided. The local attitude is shown by a speech made a little while ago at a meeting of an association of business interests. Someone during the meeting said that Los Angeles could not grow much more because she lacked the necessary water supply. One of the speakers who followed replied, "What if we do; ain't we got Mulholland and Lippincott? Didn't they get us the water before? If it ain't in the Sierras, by God, they will go to Portland, Maine, for it if necessary, and we'll put up the money."

It looks as though they would, if Mulholland says it is necessary. But, of course, it will not be, because Mulholland has the future provided for with practical plans. Several times local movements have been started to make some kind of a tribute to Mulholland. His friends have always squelched these. They know Mulholland too well. And what's the use, anyway? The 290-mile Los Angeles aqueduct is his monument—set off by the homes of half a million people made possible by his works. But what William Mulholland doubtless considers his real recognition is the confidence of the Los Angeles people in him. And on that point there is no room for doubt.

TEMPORARY WATER TANK REPAIR

OCCASIONALLY the heavy galvanized water tank on a concrete mixer develops a small leak. As it is not always desirable to shut down the mixer until proper repairs can be made, a quick repair can be accomplished by draining the tank, carefully wiping all the moisture off the metal at the leak and pouring a small amount of paraffin into the opening. This will prove a quick repair, and often a permanent one.

As a rule, not enough provision is made for temporary repairs, nor is sufficient attention paid to the tools required for the continuous running of modern machines. The idea of the above method for temporary repairs could well be applied to the plant in general, by keeping on the job, immediately available and at the point where they might be needed, the necessary tools and repairs to keep the plant running.

ODD JOBS WITH A STEAM SHOVEL

A STEAM shovel is an exceedingly useful thing to have around and often proves a genuine labor saver in ways not always anticipated either by its makers or its owners. It is a great tool for doing odd jobs.

A shovel owned by the John Eichleay, Jr., Company of Pittsburgh, was working recently on a building moving job on the Allegheny side of the river in an excavation in which considerable blasting had to be done. The mat used to keep the blasted material from flying were so big and heavy that it would have taken half a dozen men to put them in place when preparing for a blast, but the shovel operator simply stuck the dipper teeth through the mat, picked it up bodily and put it in place in a few seconds.

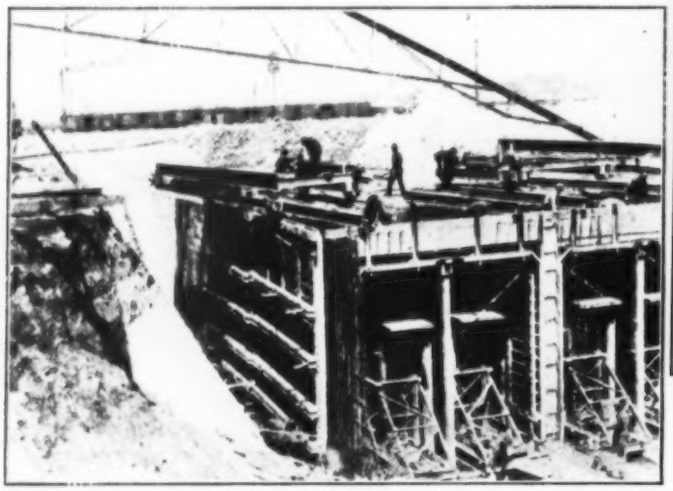
FIRE HAZARD

IN New York City a fire recently occurred the nature of which should be of interest to contractors working near or making connections to existing structures. On one of the largest jobs now going on a well-known firm of contractors was building an addition to a large structure. Brick work was removed to allow connection to be made with the steel framework. A wooden scaffold many stories high had been erected against the old structure. At night, either from torches or some other manner, a fire was started and the draft caused by the high wall gave the fire such headway that considerable damage was done both to the old building and the new plant. No contractor can be too careful on this point. The fire hazard is a real danger on any construction job.

MOVING BIG FORMS ON A BIG JOB

WHEN a form weighs 13,000 pounds it is no easy job to handle it, but the Vancouver contracting firm of Thomas Kelly & Sons made short work of the task on its big O. K. Creek sewer job at Kansas City. This sewer, said to be one of the biggest in the world, consists of a reinforced-concrete box 23 ft. 8 in. by 39 ft., and when completed will be about 2200 ft. in length. About 800 ft. has been finished.

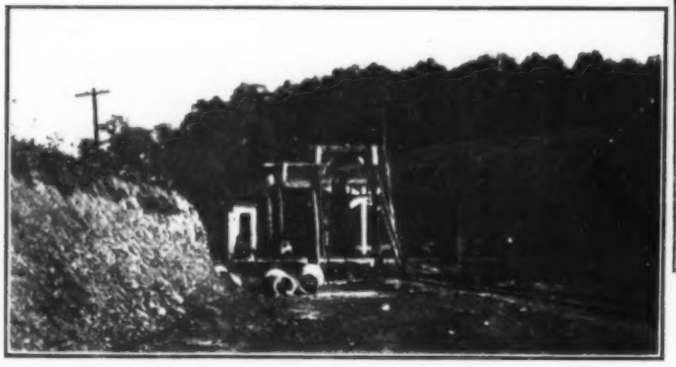
The photograph shows how the big forms used for constructing the walls of the box are moved. Two of these forms are used on each side, one being allowed to remain in place while the other is moved forward. In the photograph one of these forms is just being



moved into its new position. This is accomplished by suspending the form from a traveler, which moves on rails laid on top of the box. The form to be moved is swung out far enough to clear the second form, which remains in place until the concrete is set. The first form is then moved forward and placed beside the reinforcing bars which already have been set up.

GETTING ACROSS A RAILROAD

HOW a Pennsylvania contractor handled his industrial track at a point where the road he was building crossed a railroad track is shown in the photograph with this article. As can be seen, the lift drawbridge principle was applied, and it was a simple



matter to pull the sections of industrial track to a perpendicular position whenever a train was due on the railroad. The picture was taken on a job being done by the Samuel Gamble Company of Carnegie, Pa. This particular contract was in Butler County, between Mars and Evans City. A 5½-mile strip of reinforced-concrete road, 18 ft. wide, is being built. Work began Sept. 1, 1920, and about 2 miles of road were finished last year. The remainder of the work is now in progress.

PATCHING ROADS ECONOMICALLY

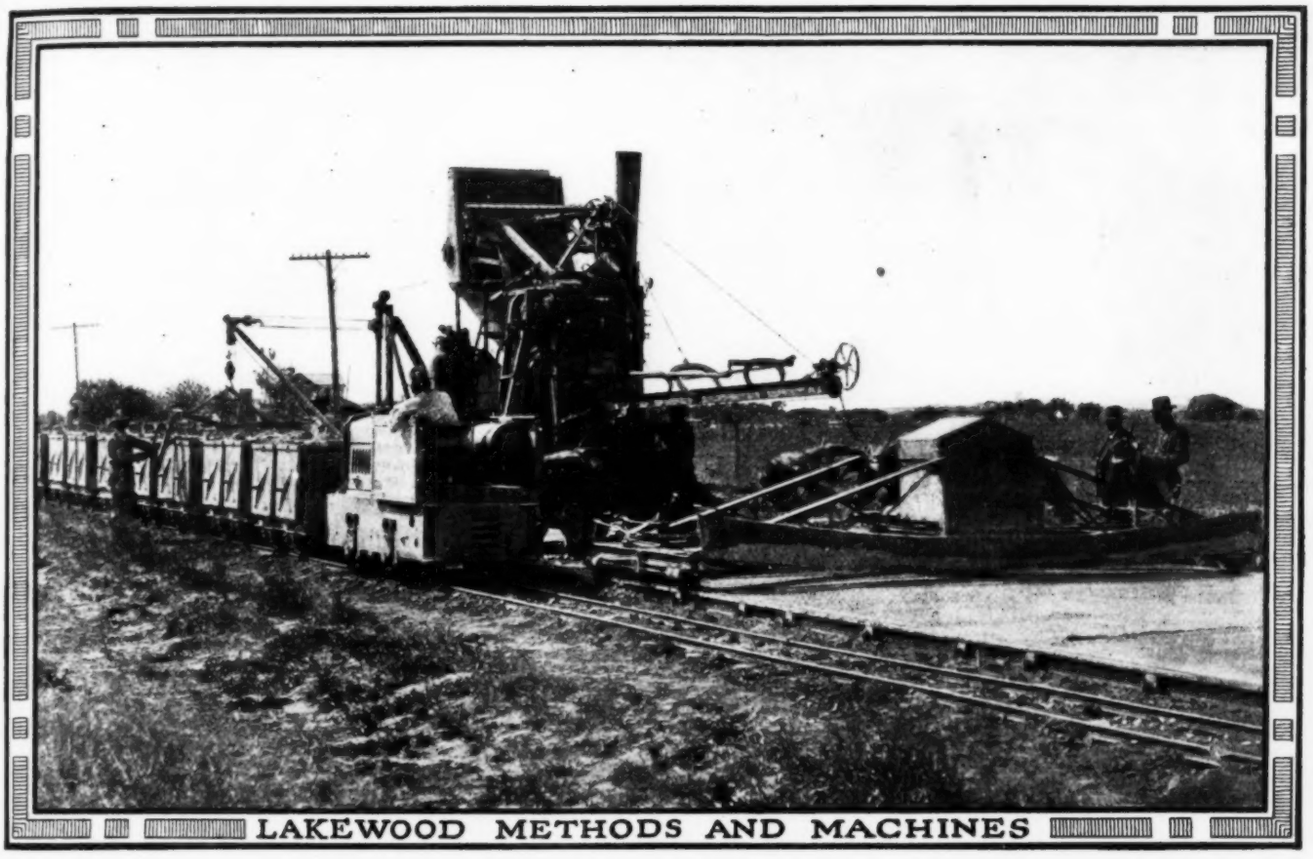
THE photograph which accompanies this paragraph shows an improvised outfit for mixing and applying cold patch material used by a Rensselaer County, New York, road gang. After the material is mixed

in a small concrete mixer it is transported by hand in a home-made carry-all. An improvement on this method might be to use a wheeled scraper, as they are generally available in county road outfits.

HANDLING SLUDGE WITH CONVEYORS

EXCAVATING earth and rock is one thing and excavating sludge containing 30 per cent moisture is quite another. Coincident with the construction of several tanks at the Back River Disposal Plant,

owned and maintained by the city of Baltimore, it was necessary to remove a considerable quantity of sludge. After experimenting with several methods of handling this material, a battery of five 42-ft., smooth-belt conveyors was installed, as shown in the photograph, and they successfully handled this material at the rate of 30 cu. yd. per hour. One of the conveyor's works at an angle of 30 degrees.



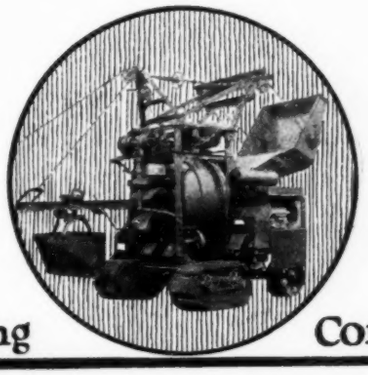
Potts & Prentice Report Wonderful Success with Lakewood Plant

About 40 miles of 18-ft. concrete road 8 in. thick is being built by Potts & Prentice near Wichita Falls, Texas. The work is being completed at the rate of over 900 feet a day. On April 14th 1000 feet of road was laid.

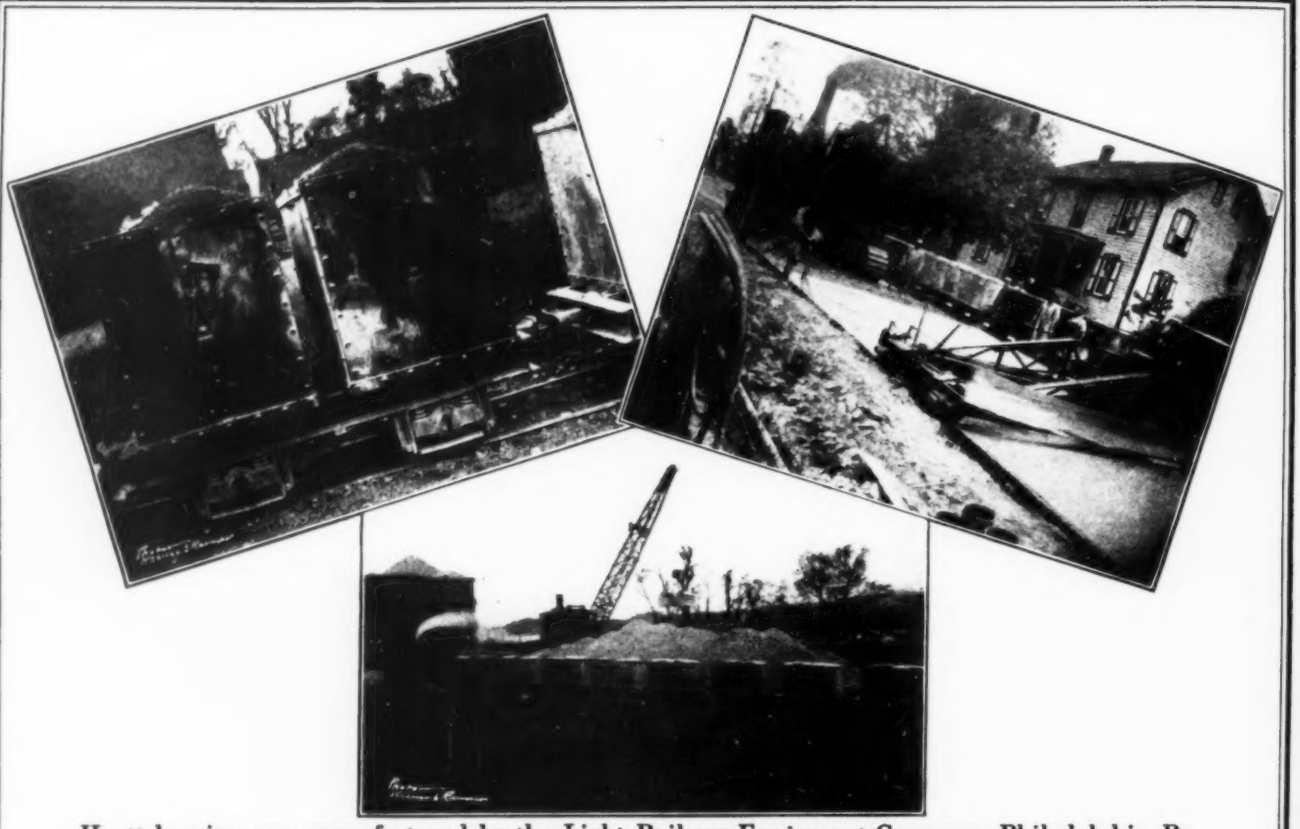
The contractors are exceedingly well pleased with their Lakewood road plant. In fact, Mr. Prentice says that the plant, as a whole, has lived up to expectations in every way.

The Lakewood equipment in use includes 2 Pavers (14-E), 52 Cars, 102 Batch Boxes, 5 miles of Track, 2 Finishers, 2 Subgraders, 2 double unit Pumps, 100 Tunnel Traps.

Ask for a copy of "Reducing the Guess in Road Work."



The Lakewood Engineering Company, Cleveland U.S.A.



Hyatt bearing cars manufactured by the Light Railway Equipment Company, Philadelphia, Pa., used by the Pennsylvania State Highway Department on the Harrisburg-Williamsport highway.

They're Laying 300′ of 18′ Road Per Day

These pictures show the work in progress on the Harrisburg-Williamsport highway, which has now reached Halifax, Pa. Every day they lay 300′ of 18′ concrete road and 60 easy running, durable Hyatt equipped cars are helping keep up the good work.

Your cars are subject to severe abuse and frequently wear out during the life of one contract. Better cars, more carefully constructed of better materials and equipped with Hyatt bearings, will last indefinitely. As your cars are the connecting link between the stock pile and the mixer, dependable car service prevents costly shut downs. By paying a little more for well made Hyatt bearing cars you can secure dependable, durable equipment that can be taken from job to job and that will prove a real investment in the money saved.

In addition to the durability of cars equipped with Hyatt bearings, they are so easy running that one locomotive can haul twice as many cars per trip—a real saving in fuel and equipment.

One greasing each season is the only attention these better cars require.

Buy good equipment—the kind that lasts—specify that your cars, locomotives and mixers be Hyatt equipped—it pays.

Hyatt Roller Bearing Company, New York, N. Y.